

22GHz water maser survey of Xinjiang Astronomical Observatory

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Abstract. Water masers are good tracers of high-mass star-forming regions. Water maser VLBI observations provide a good probe to study high-mass star formation and the galactic structure. We plan to make a blind survey toward the northern Galactic plane in future years using 25m radio telescope of Xinjiang Astronomical Observatory. We will select some water maser sources discovered in the survey and make high resolution observations and study the gas kinematics close to the high-mass protostar.

Keywords. water maser, survey, star formation.

1. Introduction

High-mass star forming regions are usually at far distances, heavy obscuration makes it difficult to observe them. The water masers are good probes of physical conditions and dynamics of the star forming regions. Maser VLBI observations are the unique mean by which one can explore the gas kinematics close (within tens or hundreds of AU) to the forming high-mass protostar (Moscadelli et al. 2011). Measure trigonometric parallaxes and proper motions of water masers found in high-mass star-forming regions by VLBI reference method can provide very accurate distance of them. Combining positions, distances, proper motions and radial velocities yields complete 3-dimensional kinematic information of the Galaxy (Xu et al. 2006; Reid et al. 2009). Water masers are very rich in the Galaxy, they are reliable tracers of high-mass star-forming regions (Caswell et al. 2011). Therefore, it is valuable to discover more water masers associated with high-mass star-forming regions.

Earlier water maser searches have chiefly been made to targeted sources, many masers may not be discovered. There are only a few unbiased water maser surveys (Breen *et al.* 2007; Walsh et al. 2008; Caswell & Breen 2010). Recently, one much larger blind survey toward 100 square degree of southern Galactic plane has been completed successfully (Walsh et al. 2011). However, no large blind water maser survey has been done toward northern Galactic plane. We will make a blind survey toward 90 square degree of the northern galactic plane using our 25m radio telescope. We hope to discover a large sample of water masers and high-mass star-forming regions at earlier stages, and study high-mass star formation and galactic structure.

2. 25m radio telescope of Xinjiang Astronomical Observatory

Nanshan 25m radio telescope of Xinjiang Astronomical Observatory was built in 1992 as a station for the Chinese very long baseline interferometry network. It is located

at Nanshan mountains west of Urumqi city at an altitude of 2080m. Its front-end receiver system includes several receivers working at 18, 13, 6, 3.6 and 1.3cm. At 1.3 cm, one dual-polarization cryogenic receiver has been installed on the telescope recently, the noise temperature of the receiver is better than 20K. When weather is good, the system temperature is better than 50K. We built a molecular spectrum observing system in 1997. One digital filter bank (DFB) system is employed as the spectrometer, it is capable of processing up to 1 GHz of bandwidth with 8192 channels. Our telescope now can observe several molecules such as OH, H₂O, NH₃, H₂CO and H_{110 α} .

3. Our plan

We will make a large scale blind survey toward Northern Galactic plane. For that most water masers concentrated in the region along the galactic plane ($|b| < 0.5^\circ$). We plan to survey 90 square degrees of the northern galactic plane, it covers the region between $l=30^\circ$ and $l=120^\circ$, and $|b| < 0.5^\circ$. In order to complete the project in reasonable time, scan observation mode (on the fly) will be used in our observation, and final sensitivity of the survey is about 1.4Jy.

On the other hand, many surveys at millimeter, submillimeter, infrared wavelengths discovered a large sample of possible star-forming regions, e.g. Bolocam, Planck, Glimpse and MIPS. These sources provide us good candidates for searching water masers. We also can select some sources and make targeted survey.

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